

EXECUTIVE SUMMARY

Title: V-22, Great Bumpersticker, But What Can It Do?

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Thesis: The capabilities of the V-22 will provide the conceptual framework of employment and deployment from which tactics and doctrine can be drawn.

Discussion: The V-22 is undergoing operational and developmental testing, it is time to produce the conceptual framework for employment, tactics and doctrine for the tiltrotor. This technology will significantly improve assault support. The V-22 will dominate assault support, not just by the tactics employed, but by the character of its ability to maneuver in the battlespace environment. Employment and deployment should be based on the capability of: aerial refueling, combat radius, payload, self-deployability, shipboard capability, speed and survivability. Technologies, such as the V-22, will not win battles; rather, battles will be won by exploiting their capabilities. The tactics should be pioneered in peacetime, refined and perfected prior to conflict.

Conclusion: For the V-22 to reach its full potential, it must become part of the Marine assault support tactics and doctrine instead of a rival culture imposed by force from outside. The development, adoption and implementation of Tiltrotor...From The Sea will bring assault support into the 21st century.

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Chapter One

CONCEPTUALIZE NOW

As the Marine Corps shifts from CH-46Es to V-22s to support its Operational Maneuver From the Sea (OMFTS), traditional tactics of assault support must be reviewed and doctrine must be revised. With the advent of the tiltrotor technology, tactics and doctrine for assault support will change, but the essence of assault support will not. Development and cultivation of a new expertise in assault support tactics is required. "The unique characteristics of the V-22 and its future role upon the integrated battlefield of tomorrow will require an expansion of existing doctrine and tactics in many areas."¹

This paper will compare the relative effectiveness of the current medium lift asset (CH-46) and the future asset (V-22) and their ability to support OMFTS. The V-22 will be called upon, early in the 21st century, to exert its influence in different regions in the world. Although many studies have examined and compared capabilities, this paper will focus on the relative capabilities and resulting assault support concepts that will influence potential real world contingencies. If developed correctly, the tactics and doctrine of the V-22 will ensure that limitations associated with the medium lift aircraft do not significantly impact operational planners, as they did in Desert Storm.²

Tomorrow's assault support tactics must exploit the principle of maneuver to a greater extent than have previous assault support assets. Tactics developed prior to V-22 fleet introduction will provide the foundation for training and educating Marines in the philosophy, principles, and techniques of warfighting.³ The lateral boundaries that restrain current helicopters will be significantly enlarged. The inherent speed, range, and flexibility of the V22 will combine to make the Aviation Command Element (ACE) a more versatile asset.

The capability of vectored thrust is relatively new. Vectored thrust is what allows the V-22 to take-off and land like a helicopter, and fly like an airplane by tilting its wing mounted proprotors.⁴ Vectored thrust offers a new concept in assault support aviation.

Tactics should be based on a combination of experiences, characteristics, and capabilities of helicopter and fixed wing. The tactics envisioned for the V-22 should describe the assault support warfighting philosophy, exploiting the distinct characteristics and

capabilities of the tiltrotor. The tactics should articulate the operational concepts that will govern the employment of assault support assets at all level. The validity of the tactics developed for the V-22 will directly affect the Marine mission capability for the future. The concept of employment and tactics should be the starting point of the Aviation Command Element (ACE) and the Ground Command Element (GCE) to develop solutions and options for specific missions. The Joint Forces Air Component Commander (JFACC) will have a sweeping and pliable array of combat capability. The capabilities that will come with the V-22 will become increasingly relevant as the Initial Operation Capability draws closer. This platform will play a significant role in facing regional threats and challenges in the year 2001.

The Executive Branch, Congressional Branch and the Military Services of the United States agree that the requirement for the V-22 is justified. A Program Decision Memorandum (PDM) was signed by the Under Secretary of Defense, on 10 February 1995, designating the MV-22/CV-22 an integrated program for the Navy, Air Force and Special Operations Command. "The U.S. Government and Industry have invested 40 years and five billion dollars developing the tiltrotor technology."⁵ With Initial Operational Capability of 2001, much has been done, and much is left to be done -- including developing concepts for employment, tactics and doctrine. Assault Support will take a quantum leap forward with fleet introduction. The challenge is to adopt a conceptual framework for tactics, deployment and employment that is consistent with capabilities and realities in the operational battlespace environment. This requires focusing on: operational objectives; new maneuver capability; shaping of the battle; and exploitation of gaps, weaknesses, and opportunities. When the aircraft arrives, tactics need to be in place. With these tactics, Marines should have an understanding of what the V-22 can do, what it cannot do and what is required to employ it. The tiltrotor tactics can be exploited by innovative operational doctrine and organizational adaptation which may achieve significant gains in military effectiveness. If the operational planners fail to change tactics, the V-22 will become impotent on the battlefield. The assault support operational art must plan and employ these assets to maximize their contribution to the overall tactical, operational, and strategic objectives.

While the aircraft is undergoing operational and developmental testing, it is time to

produce the conceptual framework for employment, tactics and doctrine for the tiltrotor. This technology will significantly improve assault support. The V-22 will dominate assault support, not just by the tactics employed, but by the character of its ability to maneuver in the battlespace environment. Employment and deployment should be fundamentally V-22 *using* rather than V-22 *driven*, exploiting the capability of: aerial refueling, combat radius, payload, self-deployability, shipboard capability, speed and survivability. Technologies, such as the V-22, will not win battles; rather, battles will be won by *using* or exploiting technologies capabilities. The tactics should be pioneered in peacetime, refined and perfected prior to conflict. In keeping with the Commandant's guidance, the tactics should provide the Marine in the field more timely and relevant doctrine, tactics, techniques, and procedures.⁶

Currently, there are no doctrinal or tactics written on the future medium assault support; this paper will compare the capability of the CH-46/V-22 while providing the conceptual framework of employment and deployment from which tactics and doctrine may start to be drawn.

Chapter Two

MEDIUM LIFT ASSAULT SUPPORT COMPARISON

The current medium lift aircraft (CH-46E) is assigned to fifteen HMM squadrons. The CH-46E, commonly called "Sea Knight," provides assault transport of combat troops, supplies, and equipment during amphibious operations and subsequent operations ashore. The primary mission is transportation of combat troops, while the secondary mission is transportation of supplies and equipment.

Medium lift aircraft tasks will change as the capabilities of the V-22 are realized after fleet introduction. The current medium lift mission is currently broken down into ten tasks as depicted in the chart below:

The Medium Lift Aircraft Tasks
Combat Assault Transport
Evacuation Operations
Mobile Refueling
Airborne Control And Coordination
Self-defense Capability
Operating From Amphibious Shipping
Extended Range Operations
Operations At Night/Adverse Weather/IFR
Search and Rescue
Operations In All Environmental Conditions. ⁷

The V-22 will replace the superstar CH-46E. The V-22 will be the guiding force behind the planning and execution of assault support in the 21st century. If the advantages are clearly known and exploited by the commander, the ability to shape the battlespace will be significantly increased.

Deficiencies

The CH-46 has been out of production since 1971 and has deficiencies in capabilities. The fleet is old, with a declining inventory of limited assets and inadequate performance. The Operational Requirement Document (ORD) for the Medium Lift Replacement (MLR), dated 29 September 1993, documented the deficiencies in current capabilities. The deficiencies include: poor capability to operate in adverse weather, limited ability to operate in an NBC

environment, lack of air refueling capability, aging communication, high maintenance requirements, limited navigation capability, restricted payload, limited range, limited self-deployment, limited self-protection, lack of speed, extremely limited survivability and threat protection.⁸ These deficiencies severely hamper the Marine Corps and, more importantly, the MEF commander in their ability to influence the single battle with medium lift assault support assets.

Drive systems, rotors and flight controls are being changed out, as part of a Dynamic Component Upgrade Program (DCUP). The DCUP will prolong the life of the CH-46E fleet until V-22 fleet introduction in 2001. A Service Life Assessment Program (a program to identify those components that must be changed) and a Service Life Extension Program (to replace the needed components) are underway. These programs will keep the CH-46E a viable assault support asset until fully replaced by the V-22 in the year 2017. These programs extend the life of the CH-46E, but do nothing to modernize or improve performance of the platform. When the aircraft is completely replaced by the V-22 in 2017, the CH-46 will have been in the inventory for 53 years. The last CH-46 pilot has not been born, yet.

CH-46E Sea Knight

"The CH-46E Sea Knight is a twin engine powered, dual piloted, tandem rotor helicopter designed to operate in adverse weather conditions, day or night. The two T58-GE gas turbine engines on the CH-46E can provide power for operations at a normal gross weight of 20,800 pounds and maximum internal or external gross weight of 24,300 pounds."⁹ Marines started flying CH-46E Sea Knights in 1962 as a direct descendant of the Boeing 107, fielded in 1958. The CH-46 replaced the aging UH-34. Between 1962 and 1975, 600 CH-46s were procured by the Marine Corps; 239 airframes remain. The CH-46 has been the Marine Corps' primary assault asset for 34 years. Most aircraft are rapidly approaching their 10,000 flight hour service life or 30 years service life.

The CH-46E has served the Marine Corps well, but it has passed its prime.

Clearly, the Marine Corps lacks a medium lift assault support aircraft that can conduct assigned missions into the 21st century. The CH-46 cannot adequately support Over-The-Horizon missions at night and in adverse weather.... The aircraft does not have enough fuel endurance and can only transport 12 combat loaded

Marines. CH-46 Sea Knight helicopters are no longer capable of conducting the medium lift mission.¹⁰

V-22 Osprey

The V-22 is a dual piloted tiltrotor aircraft with two 38 foot rotor systems and engine/transmission/nacelles which are mounted on each wing tip. The aircraft operates as a helicopter, taking off and landing vertically. However, once airborne, the nacelles rotate forward, converting the V-22 to fixed wing flight for high speed, fuel efficient flight.

"The Bell-Boeing V-22 is a new concept in aircraft. Finding its roots in the Boeing Vertol 76 (1958), the Bell XV-3 (1958, and the Vought XC-142A (1964), it has evolved through the joint NASA/Army XV- 15 to its present form."¹¹ The XV-3 demonstrated that the concept was possible, while the XV-15 exhibited that technology had developed to the point where the tiltrotor may be operationally suitable.

The V-22 was originally scheduled to be introduced to the Marine Corps fleet in 1991. The program has been the center of budget battles over the last two administrations and now is on track to deliver four production representative aircraft in December 1996. Developmental and Operational Testing is ongoing. Low Rate Initial Production (LRIP) aircraft are scheduled for HMT-204, Marine Aircraft Group 26, 2nd Marine Air Wing in 1999. The Marine Corps will be the first service to receive Initial Operational Capability in 2001. The Air Force will receive the first of CV-22's in 2003, followed by the Navy with its HV-22 in 2010.

Comparison

A comparison of speed, payload, refueling capability, survivability and range will highlight the enhanced operational and performance capabilities of the future medium lift aircraft. "A conventional helicopter is the victim of its unique ability to hover. The design characteristic which optimize hover capability limits its top speed and range, thus helicopters do one or two things well at the expense of others"¹² The V-22 combines hover capability with fixed wing capability when the aircraft is up and away. When the aircraft is in the helicopter mode, the proprotors act as helicopter rotors, providing a strong lift capability. In

the fixed wing mode, the proprotors provide the cruising efficiency, range and speed of a fixed wing, thus providing the best of the helicopter and fixed wing capabilities. A side by side comparison shows the radical improvement in capability that is provided by utilizing the best of both worlds (fixed and helicopter) in the V-22. The table below indicates the percentage increase in capabilities.

Capabilities	CH-46E	MV-22	% INCREASED
Max. Gross Weight	24,300	60,500	149 %
External Load	4,300	15,000	249 %
Internal Load	4,300	10,000	133 %
Troops	16-18	24	33 %
Operating Radius	100 NM	340 NM	340 %
Endurance	2+00	2+50	42 %
	120 KIAS	250 KIAS	108%
	12 pax	24 pax	100%
Max. Airspeed	145	275	90 %
Cruise Airspeed	120	250	108 %

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Speed

"Speed is the essence of war."¹³ Just as Sun Tzu realized the importance of speed in

war, the importance of airspeed as it relates to assault support cannot be overlooked. The airspeed advantage of the V-22 will allow assault support assets to "strike the enemy at a time or place or in a manner for which he is unprepared."¹⁴ The advantage clearly indicates that the V-22 will operate in a much larger battlespace, being able to influence time, tempo, depth, and synchronization. The speed will reduce the exposure time to air defense weapons engagement. When the speed is combined with payload, the result is a distinct advantage: more options to the GCE, greater ability to sustain larger forces, and greater ability to keep an adversary off balance with the exploitation of speed and range. Because the V-22 will be able to respond more quickly in a crisis, it meets the need for "An aircraft ... that can fly faster and farther than current rotary aircraft."¹⁵

Loads

The CH-46, due to its age, is limited to 16-18 Marines, while the V-22 can carry 24 combat loaded Marines. This represents an increase of 33% over the current capacity. The CH-46 has excellent flight characteristics when performing external loads; however, it can only carry 4,300 pounds and it is limited to a single point. The V-22 is capable of carrying the heaviest High Mobility Multipurpose Wheeled Vehicle (HMMWV) at 9,500 pounds. The V-22 has a dual point system, using two external pendants to attach external loads to the aircraft in two points. The dual point system ensures the external load remains stable during flight. "This method allows higher transit airspeed...and is the preferred method from an aircrew standpoint."¹⁶ Special considerations must be given to the V-22 when considering external loads due to its high down wash velocities, "unstable soil can produce dust cloud restricting movement in and around the landing zone."¹⁷ While the twelve and six o'clock positions remain relatively calm, the downwash at the three and nine o'clock positions is substantial.

Current CH-46 limitations of range and payload have been compensated by the use of allied aircraft based ashore and by the use of forward arming and refueling points.¹⁸ With greater payload, the distinct advantage would go to the V-22 because of its ability for a greater build-up of combat power ashore.

Aerial- Refueling

The location of the theater of operation greatly influences any campaign. Aerial-refueling provides self-deployment capability, giving the V-22 strategic, operational, and tactical mobility. The CH-46 must be forward deployed, or it must be brought to the theater by strategic air and sea lift. The V-22's ability to aerial-refuel provides a greater ability to be effective in crisis response and forward presence. "The ability of forces to linger on station in a crisis area for extended period provides an advantage for decision makers as they monitor the situation and determine when, how or whether to respond."¹⁹ The V-22's ability to aerial refuel extends the MEF commander's ability to transition for power projection for deterrence to projecting combat power.

Survivability

The CH-46 is slow and vulnerable when compared to the V-22. "The current inventory of assault support aircraft has very limited and antiquated self-protection against the proliferation of ground launched, anti-air missiles"²⁰ The V-22 has an integrated EW suite which is a significant improvement over current medium lift assets. The suite will include a programmable radar-warning receiver, laser warning receiver, radar jammers and chaff/flare dispensers. The V-22 is overpressurized for chemical-warfare protection. The infrared signature is reduced to 5% of the unsurpressed CH-46. In the area of self-protection, the current MV-22 lacks a turreted gun for self-protection, while CH-46s have dual mounted 50 caliber machine-guns.

What platform will escort the V-22 and ensure that it is survivable? Current medium lift escort falls to the AH-1W. This platform, although formidable, lacks the speed and range to provide attached escort. Noncombatant Evacuation of Somalia found assault support assets launched unescorted, due to the lack of speed and range of the AH-1W. Until an aircraft is identified to replace the UH-1N, AH-1W and OV-10, a combination of AH-1W and AV-8B (attached and detached) escort based on the threat is the logical choice for escort for the V-22. However, it is likely in the future that combat losses, maintenance availability and anti-armor missions will find the V-22 unescorted.

Real world contingencies have a significant rotary wing threat (i.e. Bosnia). The

Armed Forces Journal article, "One Missile Away From Disaster," shows how the transports used in the rescue of Captain Scott O'Grady were vulnerable to interdiction by small arms and surface-to-air missiles (SAM's). "Fortunately, the two SAM's used against the CH-S3Es were early-model Russian SA-7 shoulder fired missiles"²¹ In addition to the state of the art EW suite the V-22 requires some sort of self-protection. Possible candidates for this self-protection may be a turreted gun and an air-to-air capability.

Range

The CH-46 has limited tactical mobility; however, the V-22 has a much greater tactical and strategic mobility. Range can be used to put a potential adversary at a disadvantage, achieving tactical, operational or strategic advantage. The V-22 gives decisive advantage to achieve surprise, physical momentum, flexible engagements and massed effects. There are several points worth remembering when discussing range. First, while operational reach enhances the concept of "Tiltrotor...From The Sea," the V-22 will provide a more rapid, flexible and opportunistic maneuver. Next, battle tempo will increase, allowing forces to generate a faster operational tempo than current medium lift assets. Range affects both the deployment capability and also the radius at which medium lift assets can influence the area of operations or area of influence. With greater range, assault support assets will have a greater likeliness of avoiding detection while exploiting weaknesses and gaps.

The recent past points to the limited range of current medium lift assets. For example, in Desert Storm, the "CH-46E found itself flying long distance to flight objectives. The Forward Area Refueling Points became the 'lifeblood' which enabled these long range operations."²² Range severely limited the operational use to planners. In Provide Comfort (Kurdish Humanitarian Relief) LtCol Linn noted, "The reduced range of the CH-46E hampered the squadron efforts to provide relief for more distant camps."²³ Both examples show the limitations that current medium lift assets have on current operations.

Case Study: Desert One

An historical example worth examining, with respect to range, is the failure of

Operation Eagle Claw, the Iranian rescue operation of 1980. Operation Eagle Claw was a daring but tragic raid to rescue fifty-three hostages from Iran. The discussion will focus on the helicopter selection and the range effect on the mission.

The primary criteria for selection of the RH-53 included range, payload, and the ability to be positioned rapidly. Primary candidates for the rescue mission were the CH-46, CH-47, CH-53, RH-53 and the HH-53. Range, shipboard compatibility and payload favored the 53 family; eight RH-53's were the best combination.²⁴ It is ironic to note the plans for a second rescue attempt, initiated just two days after the disaster of Desert One, rejected the RH-53D in favor of the UH-60 Blackhawk helicopter with modified fuel tanks.²⁵

At 1930, 24 April 1980, six C-130's launched from Masirah, Oman. At the same time, eight RH-53D helicopters launched from the deck of the USS Nimitz in the Gulf of Oman (fifty miles from Iranian coast). Three of the Hercules aircraft were EC-130's with 18,000 gallons of jet fuel for the helicopters. After refueling, the helicopters were scheduled to head for a hide site some fifty miles northeast near Garmsar, Iran. The need to refuel the RH-53D, prior to the Garmsar, ultimately caused the demise of the mission at Desert One. During the forward refueling, a helicopter and an EC-130 collided, killing eight men. Having already lost two 53's for mechanical failures, the mission was aborted because the joint force no longer had the required number of helicopters to complete the mission. Had the refueling been successful, the RH-53D's would have continued to the hide site at Garmsar, rested and assaulted the embassy the following day. At this time the RH-53D with commandos and hostages would marry up with C-141's and abandon the RH-53D's.

If the V-22 had been available, the outcome may have been different. The requirement for the refueling site (Desert One) would not have existed. The V-22's could have been aerial refueled just prior to the assault on the embassy. Landing at the embassy, they would have discharged the commandos, loaded the hostages and commandos and then departed directly for safe haven. The operation, as proposed, would have eliminated the need for the C-141's (commando/hostage extract) and the EC-130 (Desert One refueling). Considering the V-22's speed and range, it is likely that the entire mission could have been conducted in one evening, and the outcome might have been drastically different.

This chapter has highlighted the deficiencies of the current medium lift assets and

compared the capabilities (focusing on speed, payload, refueling, survivability and range).
With this as a background Chapter Three will turn to the future and discuss how the V-22
will be deployed and employed when it arrives -- Tiltrotor...From The Sea.

Chapter Three

TILTROTOR ... FROM THE SEA

This chapter will present a vision of Tiltrotor...From The Sea. Tiltrotor...From The Sea (a superficial and unprecise term coined by a Command and Staff student) will not owe its success to technology in the form of a tiltrotor aircraft, nor has it emerged from the bowels of Breckinridge Auditorium. This distinct form of assault support evolved from exploiting or *using* the capabilities of aerial refueling, combat radius, payload, self deployability, speed and survivability to win future battles. These battles will be won by men, not tiltrotor aircraft. Any emphasis on technology that neglects the role of assault support leadership is fundamentally misplaced.

Tiltrotor...From The Sea is defined as the movement of forces using the tiltrotor, to secure or retain a positional advantage in relationship to the enemy. In its purest sense, it is utilizing this airframe to move Marines to strike the enemy in his flanks or rear. Striking the enemy may include massing firepower and/or Marines. This should not be limited to using the V22 to gain a position of advantage, but also to move faster than the opponent.

The V-22 will be found operating in the littoral areas -- those areas primarily between the latitudes of 45 degrees north and 45 degrees south. All significant crises of this century have occurred within these boundaries and the following significant facts indicate why Tiltrotor...From The Sea is relevant:

- 70 percent of the planet is covered by water and over 80 percent of the world's nations are in the littorals;
- 7 of every 10 people on earth live within 200 nautical miles of the sea;
- 4 out of every 5 national capitals are located within the littorals; and
- 125 cities with a population of over 1 million are located in the littorals, and within 10 years that number will rise to 300 cities.²⁶

This chapter will present a conceptual framework to begin developing tactics and doctrine. Future tactics and doctrine should be viewed as a guide, not as a requirement to be judged against. The initial Tiltrotor Tactical Guide will come from the Operational Test and Evaluation Department of HMX-1, and will be followed by, a Tiltrotor Tactics Manual,

written by Marine Air Weapons and Tactics Squadron-One. The tactics and doctrine will be revised and refined by fleet V-22 pilots after the aircraft arrives in the fleet. This chapter will deal with the opportunities created by the V-22, discussing the employment and deployment that the V-22 offers maneuver warfare.

Material presented to-date makes great bumper stickers, but what can the V-22 really do? The Marine Corps' vision of medium lift assault support must expand because this aircraft offers much more than the current medium lift assets. The conceptual framework will discuss Tiltrotor...From The Sea based on the employment and deployment of the V-22. It is based on a set of organizing concepts that emphasize on how to think -- not what to do. Conceptually, there is nothing new about or particularly original about Tiltrotor...From The Sea. What is new is the attempt to organize successful concepts from the past around a unifying theme and articulate the theme so it can be understood and applied more readily in development of tactics and doctrine for the V-22.

Deployment

Being able to respond is a significant factor in developing a coherent focus for Tiltrotor...From The Sea. Tiltrotor...From The Sea is power projection from the sea using the tenets of maneuver warfare. The V-22 will operate as part of an inherently joint force-- a single entity-- poised on sovereign sea bases. Traditional deployment of medium lift assets will take a quantum leap forward in the tactical, shipboard and self-deployment capability of the V-22.

Tactical

The tactical advantage comes from the V-22's unparalleled flexibility for tactical application in the use of speed, maneuverability, range, endurance, self-deployment, payload, survivability and combat power buildup rates, which exceeds all helicopter options. It has the ability to use standoff, surprise and deception to threaten a larger maneuver area and exponentially complicate the threat's defensive problems. Once committed, the V-22 supported force exceeds the enemy's ability to counter maneuver because of the V-22's faster combat buildup rate and operational tempo (optempo).²⁷

It is likely that the Marine Corps will meet an enemy that has equal or greater firepower and surface mobility. What the V-22 offers is the ability to use tiltrotorborne forces to gain an advantage of relative mobility. Because of the V-22's range, it will operate in a larger battlespace. This larger battlespace will allow for the employment of widely dispersed operations against key objectives. The maneuver space will contain the opposition's movement and enhance the Marines' own movement. The V-22 provides the platform to exploit maneuver to avoid the attrition-based frontal assaults on prepared enemy defenses. The V-22 offers this ability to move around prepared positions and generate a second front in the enemy's rear or flanks, and then rapidly and aggressively exploiting the second front to swiftly defeat the enemy. The V-22 is a force multiplier for Marines who are prepared to use surprise, deception and dispersion to deploy small units to direct fire and air, engaging and controlling the enemy.

This strategy will only work well on the enemy only some of the time. If history is any indicator, the next war will not reflect the last. The Marine Corps must be prepared to go up against a prepared enemy in depth--an enemy that shows no surface or gaps. Will Tiltrotor...From The Sea fail? The answer is no; it is precisely in this environment that the true combined arms of the Marines can be used to create a surface, gap or weakness. To meet these objectives, an amphibious raid against the enemy's critical vulnerability (C2, WMD or IAD) could provide such an opening that will be exploited by assault support.

The V-22 will permit major assault support operations at night through surfaces or gaps in the enemy's flanks or rear. Faster assault completion times allow for more sequential evolution and greater overall optempo opportunities. "High optempo yields tactical opportunities for maneuver and creates a cascading maneuver effect that will enable Marines to win more quickly, more decisively, and with fewer casualties."²⁸ The V-22 will help commanders dominate the expanded battlespace with fewer forces. The conceptual framework for the V-22 may be to insert a small force capable of massing long range fires (tactical missiles from ships as well as tactical aircraft) as compared with massing Marines. This will permit engagement of the enemy deep, without decisive engagement on the part of the assault force.

The V-22 will be used to transport this agile, light and lethal force to destroy, disperse or

fragment the enemy's combat power. This would prevent the enemy from massing his forces or maneuvering them effectively. These preemptive shaping operations decrease the possibility of future defensive action and strengthen the MEF dominance of the battlespace. The mobility of the V-22 and lethality of fire become the assault support's main weapon; this allows the firepower to have a greater effect with proportionally less mass.

To envision how the V-22 may be tactically employed in a real world conflict, consider Bosnia Herzegovina. As part of a NATO enabling force, U.S. forces were deployed to Bosnia in "Operation Joint Endeavor" in December 1995. The American Zone is currently landlocked, starting at 60 miles and up to 140 miles from the Adriatic Sea in the Muslim and Serb territory. Current medium lift assault support, stationed in the Adriatic, is limited, due to the extended distance from the American Zone. The V-22 is ideally suited for such an environment. The following map templates the current CH-46E capability over the V-22, demonstrating the clear advantage offered by launching from the Adriatic and maneuvering to circumvent weather, terrain or hostile forces.



The V-22 will allow commanders to put forces ashore quickly, where they can decisively influence events, and quickly withdraw to the relative safety of amphibious shipping in the Adriatic.

Shipboard

Marines have come ashore "From the Sea" on numerous occasions to conduct non-combatant evacuation operations, humanitarian assistance operations, and peace enforcement operations.²⁹ The amphibious platforms, from which CH-46 or V-22 will operate, are being reduced drastically. "The Navy Amphibious Fleet will shrink to 52 ships, a ten ship reduction from 1988 force level... By the year 2007 almost 80% of the 1992 amphibious force will be decommissioned."³⁰ However, with the V-22 aboard, the surviving amphibious platforms will

be more mobile and flexible.

The tactics envisioned provide for a forward presence which can be committed on short notice from distant shipping. As the United States withdraws forces and bases from overseas, shipboard platforms will play an ever increasing role. The V-22 from amphibious platforms will be used as the 911 response team, forward deployed and capable of rapid response with a flexible response to many missions. The V-22 operations from distant amphibious shipping will enhance maneuver warfare, providing faster optempo.

Self-Deployment

Strategic airlift limits the rate at which the United States can project forces. As noted in Desert Storm, "Valuable resources were allocated to transporting CH-46s to SWA. This time was expanded in the breakdown, transport, buildup and testing of helicopters to achieve mission capable aircraft in theater."³¹

Marines have always depended on sea or air lift to project their assault support capabilities into a theater of operation. Air lift extends the options to commanders by inserting assault support assets with C-17, C-141 or C-5, with limited supplies and equipment. Sea lift has traditionally been the amphibious platform from which assault support assets are normally forward deployed. Sea lift and air lift are limited and critical to projecting the CH-46E; on the other hand, the V-22 is less reliant on sea or air with its self-deployment capability. With its in-flight refueling capability, the V-22 can self-deploy to anywhere in the world in 36 hours of flight time. Self-deployment provides a faster force closure, reduced footprint and an ability to place V-22s into the theater using Marine KC-130 assets.³² This will add new meaning to the Air Contingency Force Concept.

Employment

Once the V-22 has deployed to contingencies, the focus must shift to its proper employment. From this point of departure, there are eight areas to discuss: assault support, medical evacuation, resupply, search and rescue, TRAP, air controller (airborne) and finally forward arming and refueling. The V-22 employment will dramatically increase the MEF

commander's ability to deal swiftly and decisively.

Assault Support

The concept of Tiltrotor...From the Sea expands and capitalizes upon a non-linear battlespace. Assault support assets must be structured to respond, on short notice, to MEF tasking. The agility and speed of the V-22 will permit ground commanders to influence close, deep, and rear operations in the single battle. The V-22 can be used to help shape the deep battle, while helping forces to be decisive on the close battle and logistically sustaining from the rear area operations. The V-22 will provide quick insertion capability in moving forces, supplies and equipment. The V-22, unlike all current Marine medium lift assets, will provide assault support assets with a strategic intertheater operations or operational/tactical intratheater operations.

Assault support tactics must change to support Tiltrotor...From the Sea. In 1983, assault support operations looked very different from the tactics and concepts that are currently envisioned for the V-22. During Operation Urgent Fury, approximately 100 US helicopters were used on Grenada; nine were destroyed, and a number of others were damaged. The total loss represented a loss rate of 9% in three days against an opponent, with no anti-aircraft missiles, only 7.62 mm small arms and 12.7 mm machine guns.³³ Most of the hits were to the cockpit, cabin, aft fuselage and tailboom. "No combat aircraft is invulnerable to ground fire, but V-22 is designed to reduced the area of the V-22 vulnerability to 12.7 mm (50 caliber) rounds by 90% compared to today's 'soft' helicopters."³⁴ This drastic improvement is due to the ballistically tolerant composites used throughout the V-22.

An examination of tactics used in Grenada reveals a change in philosophy over time. In Grenada, objectives centered around physical terrain rather than around the enemy. Many of the losses were attributed to restrictive ROE designed to limit collateral damage. While escorting assault support assets two Cobras were lost while surpressing an anti-aircraft site. The reason the Cobras were employed, in lieu of fixed wing and artillery, was to avoid collateral fragmentation and blast damage.³⁵ In Grenada, measures were taken to reduce civilian damage at the detriment of supporting assault support operations. Assault support tactics of the future cannot accept a 9% loss rate in three days.

This assault with Cobra escort vividly demonstrates why the Marines must change tactics to support the V-22. Assault support assets must avoid the enemy's strength and not attempt to go toe to toe with him. The Marine Corps must look to strike him at a place he is weak-- his critical vulnerability. If a sizable threat exists, assault assets should not attempt a landing nearby. If landing near a threat (as in Grenada) is required, artillery or fixed wing aviation should be used to destroy the threat prior to introducing assault support assets. With the extended range of the V-22, artillery will be outranged, and a stronger reliance will be placed on fixed wing escort. Thus, fixed wing aviation also needs to adapt its tactics to escort V-22's

Medical Evacuation

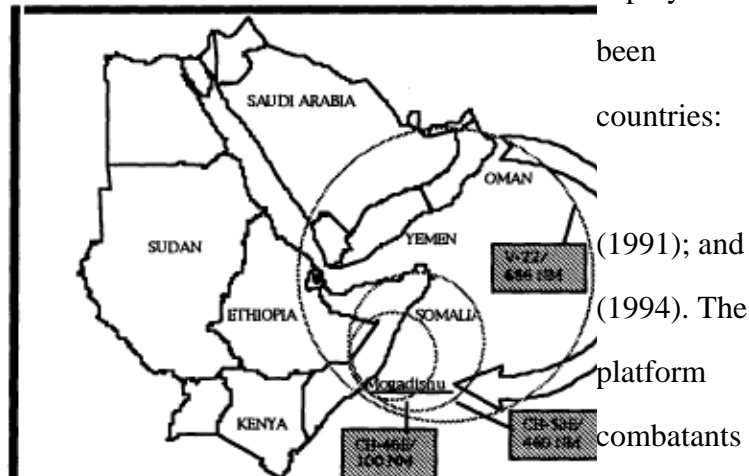
The use of the V-22 will significantly enhance the Medical Evacuation (MEDEVAC) capabilities of the Fleet Marine Force field health care system and most certainly save lives.”³⁶ The MEDEVAC situation in South West Asia caused a dilemma for operational planners in Desert Shield/Storm. Assault support assets had to travel over extended ranges to support committed coalition forces in Kuwait and Iraq, taxing current medium lift assault support assets. An after action report from Desert Storm noted that if there had been large amounts of casualties "rotary wing could not have kept pace in moving patients to the rear. An aircraft is needed that can fly faster and farther than current rotary wing assets.”³⁷

A key ingredient in the MEDEVAC employment is the speed at which the V-22 will be able to transport MEDEVAC patients for treatment. The quicker the patient is transported to adequate medical facilities, the more likely the patient will survive. The V-22 enjoys a 2:1 advantage in speed over current assets. With this speed advantage, the V-22 can complete more mission sorties in the same time period. The bottom line is that the V-22, if properly employed as a MEDEVAC platform, will lead to a significant increase in lives saved.

Noncombatant Evacuation Operation

Noncombatant Evacuation Operation (NEO) from distant amphibious shipping is

ideally suited for the V-22. The NEO is a role that has applicability around the world where Marines are forward deployed. Since 1990, NEO's have been conducted in several countries: Monrovia, Liberia (1990); Mogadishu, Somalia (1991); and finally Kigali, Rwanda (1994). The V-22 offers a responsive platform for removing non-combatants on a time critical basis.



Operation Eastern Exit, an historical example, was conducted in Somalia in January 1991. The MEU (SOC) was tasked to respond to a deteriorating situation when located in the vicinity of Oman. The Aviation Combat Element was located on amphibious shipping -- 460 nautical miles from Mogadishu, Somalia. In response, the MEU (SOC) launched two CH-53E's (heavy lift assets) to insert a security force and return to the USS Trenton with 60 non-combatants. This required CH-53 aerial refueling three times during the operations. The situation in Somalia continued to degrade to the point that an evacuation of 280 noncombatants was requested by Ambassador Bishop and subsequently approved by the State Department. This evacuation was delayed until the USS *Guam* could close within range of the ten CH-46's used to conduct the evacuation of the American Embassy. Under the cover of darkness and with the aid of night vision goggles, the evacuation was successfully completed.³⁸ The map below indicates the different ranges at which the assault support platforms could be launched.

Had the V-22 been available for the NEO:

- only one refueling would have been required during this time critical evolution;

- there would have been no requirement for amphibious shipping to close with Somalia prior to the conduct of the evacuation;
- updated communication and navigation would have enhanced mission success; and
- the night vision compatibility cockpit would have made the aircraft easier to safely complete the mission.³⁹

This is a clear example of the operational reach that the V-22 has in its ability to influence time and space from forward deployed, amphibious shipping. To complete this mission, only half the airframes would have been required, and the evacuation would have been completed in half the time.

Resupply

The dramatic effect that the V-22 will have in support of logistic resupply is the quantity that can be delivered. The V-22 enjoys a 3:1 advantage when loaded externally and a 2:1 advantage when loaded internally. The V-22 will be able to deliver more supplies with the same amount of aircraft. Or, said another way, for the same amount of supplies, fewer aircraft would be required to accomplish any supply build-up. With the V-22's performance, the logistic resupply will be more responsive to needs within the battlespace

Search and Rescue

The CH-46 is limited by time on station, range, lack of automatic hover capability, and lack of surface search radar. In spite of these limitations, the CH-46 has proven to be a highly reliable day-only search and rescue platform. CSAR is a mission that the Marine Corps is inheriting by default. In the future, Marine Expeditionary Forces, especially the MEU(SOC), may find themselves tasked to perform CSAR-type missions. The V-22 will be an enhancement over current medium lift assets because of the greater range and time on station. Employed properly, this asset will be able to conduct a larger search because of the greater range, time on station, and speed. The MV-22 lacks an automatic hover capability (i.e., doppler hover), and a surface search radar which will further enhance its CSAR

capability.

Tactical Recovery of Aircrew and Personnel

"Tactical Recovery of Aircraft and Personnel (TRAP) is the Marine's Corps mission that satisfies the Joint Chiefs of Staff requirement that each branch of the armed forces maintain its own combat search and rescue (CSAR) capability. CSAR is defined as a specialized task performed by rescue forces to effect the recovery of distressed personnel from hostile environment during wartime or contingency operations."⁴⁰ With three pilots shot down in the last year in Bosnia Herzegovina, this mission looms as a likely mission for Marines stationed in the Adriatic Sea. Most recently, a TRAP was exercised to rescue Captain Scott O'Grady.

On 08 June 95, a TRAP package, consisting of 2-CH-53s, 2-AH-1Ws, and 2-AV-8Bs, from the forward deployed MEU(SOC) launched from the USS *Kearsarge* in a successful attempt to rescue downed pilot Captain Scott O'Grady (USAF). The timeline is provide on the following page.

While much discussion has centered on the current correct platform to attempt such a rescue, the Marines from the 24th MEU(SOC) were successful, and this speaks for itself. The current medium lift assets were not used because it was felt that they did not have the necessary range to support this mission. Had the V-22 flown the mission, the total completion time would have been reduced by half. The aircraft would not have been forced to return over the same ingress route; it could have circumvented populated areas and possibly not have encountered small arms and surface-to-air missiles.

Time	Event
02 Jun 95	F-16 with Captain Scott O'Grady is shot down by SA-16
08 Jun 95, 0300	Downed pilot makes voice contact with USAF aircraft
08 Jun 95, 0310	Warning order from AFSOUTH to 24th MEU(SOC)
08 Jun 95, 0500	TRAP package launched
08 Jun 95, 0545	Push feet dry
08 Jun 95, 0635	Cobras push forward, yellow smoke in the pick-up landing zone
08 Jun 95, 0640	CH-53s land in zone and located immediately and recovered on Dash-2
08 Jun 95, 0642	Transport lift off enroute to Kearsarge, observe 3 SAMs, all misses. Transports receive small arms fire, at least one round hit Dash-2
08 Jun 95, 0730	All aircraft recovered on Kearsarge
Note: pick-up zone was 87 NM straight line distance from Kearsarge (20 NM due south of Bihac) on a side of hill. Heavy intermittent fog throughout mission.	

Air Controller (Airborne)

Although Air Controller (Airborne) traditionally not thought of as a medium lift mission, with the loss of the OV-10 and ever increasing demands on the AH-1W, AV-8B and FA-18, the V-22 may be used to influence the single battle by a Forward Air Controller (Airborne) (FAC(A)) and Tactical Air Controller (Airborne) (TAC(A)) role. This contribution will exploit the V-22's deeper projections from the sea, allowing a higher stand-off from small arms and an expanded radius of action and time on station. Ultimately, the V-22 will provide greater operational flexibility.

The V-22 is suited for the FAC(A) mission of conducting aerial reconnaissance and in exercising control from the air of aircraft engaged in Rotary Wing Close Air Support (RWCAS), Close Air Support (CAS) and Deep Air Support (DAS) missions of ground forces. The V-22 could act as the platform to coordinate supporting arms in both artillery and naval gunfire missions. If the V-22 were optimized with a laser designator, the V-22 employment will be a significant force multiplier. The TAC(A) mission would be an airborne

extension of the DASC or TACC/TADC, acting as the senior air coordinating authority over aircraft operating within its area of responsibility.

If used in this role, the V-22's could shape the battle with intelligence or with massed fires deep. The FAC(A) and TAC(A) missions will positively contribute to the concept of Tiltrotor...From The Sea.

Forward Arming and Refueling Point

Assault support assets are dependent on long, slow, and vulnerable lines of logistic resupply, putting them at a disadvantage in a highly mobile environment. The Forward Arming and Refueling Points (FARP) provides fuel and armament necessary for highly mobile and flexible force. The FARP is a temporary facility, normally located 17 - 25 kilometers from the Forward Edge of the Battle Area (FEBA).

A Rapid Ground Refueling (RGR) method provides fuel to other aircraft currently utilizing KC-130 or CH-53 aircraft at an austere location where no other fuel is readily available.⁴¹ FARP and RGR differ only in the equipment used. It is readily apparent from the following chart that the ACE has increased flexibility when using V-22 medium lift organic assault support assets. The RGR mission, until this point, has been exclusively a heavy lift mission. This flexibility will extend the operational reach of the entire assault support asset by minimizing response time and by decreasing turn around time.

TYPE A/C	CAPACITY (lbs)	BURN RATE (lbs/hour)	TIME
MV-22	9,900	3,000	3+20
CH-46E	4,400	1,500	3+00
CH-53D	13,000	2,000	5+50
CH-53E	15,545	3,600	4+40
UH-1N	1,350	700	1+50
AH-1W	2,000	900	2+15

This chapter provided a conceptual framework for developing tactics and doctrine. The deployment (tactical, shipboard and self-deployment) of the V-22 offers enhanced ability to respond quickly in a crisis in vital regions of the world. The V-22 employment (assault support, MEDEVAC, NEO, resupply, SAR, TRAP, FAC(A), TAC(A) and RGR) will

dramatically increase the MEF commander's ability to deal swiftly and decisively with his medium lift assets. Without doubt, the Tiltrotor...From The Sea will play a vital role in the future of the Marine Corps' maneuver warfighting capability.

Chapter Four

TRIAD -- AN EXAMPLE OF THE FUTURE

Operational Maneuver From The Sea is becoming a reality because of the danger of mines, hydrography and lethality of in-place defense weapons. This chapter will explore how the V-22 will be integrated in the future amphibious operations. The Marine Corps and Navy are in the process of developing doctrine for a triad of equipment to conduct Single Battle-Operational Maneuver From The Sea (SB-OMFTS) operations: the Landing Craft Air Cushion Vehicle (LCAC), the V-22 and Advanced Amphibious Vehicle (AAAV) are elements of the triad. Each element of the triad is specialized, yet some degree of overlap exists to provide the necessary redundancy for combined and surface amphibious assault.⁴² The Landing Craft Air Cushion Vehicle (LCAC), the V-22 and Advanced Amphibious Vehicle (AAAV) complement each other. Each platform will support the other toward the common goal of Operational Maneuver From The Sea. Any member of the triad used in isolation is doomed to failure; however, used together with an integrated joint combined arms, the triad is a force multiplier. The triad brings versatility, flexibility, deployability and sustainability to the forward presence and crisis response. Operating as a joint force, the triad uses sea, air and land as one continuous maneuver battlespace.

Landing Craft Air Cushion Vehicle

This Landing Craft Air Cushion Vehicle (LCAC) provides 40 knots speed over the battlespace from 25 to 50 NM at sea. The LCAC facilitates the movement of heavier loads from ship to shore and inland across the beach. Primarily a logistic vehicle used to haul heavy combat support ashore⁴³ (tanks, light armored vehicles, self-propelled artillery, airfield construction, etc.). LCAC is capable of lifting a rifle company or 60 tons of cargo at 50 KIAS through 3 foot waves. The LCAC is capable of being launched for the LHD, LHA, LPD, and LSD. It is not intended for tactical forcible entry itself; it is too big, too vulnerable and too few.

Advanced Assault Amphibious Vehicle

This Advanced Assault Amphibious Vehicle (AAAV) provides 25 knots at sea and 45 knots over land to 18 combat loaded Marines (plus a crew of three). The tactical surface forcible entry comes from the Advanced Assault Amphibious Vehicle (AAAV). The AAAV replaces the AAV7A1. The AAAV provides cross-country mobility, a stabilized turreted weapons system and armored protection. The AAAV will provide high water speed and uninterrupted maneuver transport of forward deployed Marines from amphibious shipping located over the horizon through the beach and to inland objectives.

V-22 Osprey

The third leg of the triad is the V-22, which offers a ship to objective capability through a vertical envelopment. As the Marine Corps develops the triad to support the concept of SB-OMFTS the most critical decision is how they are integrated into viable tactics. The Marine Corps must reject the self-limiting notions that these platforms are only intended to replace the current equipment. This notion results in cloning. Future concepts must not be constrained by this concept. As the Marine Corps broadens its horizon in terms of what is practical, achievable and necessary, it must be innovative. The V-22 must not be seen as merely a better helicopter that will be used to execute a worn out idea. Adapting new concepts of employment, deployment and tactics that support the new technology of the V-22 will greatly enhance the mission capabilities of the Marine Corps' medium lift when responding to potential threats.

Operations in the future will change as the Marine Corps press for the flexibility to mesh the tenant of maneuver warfare and the single battle. Today's doctrine must be refined to take advantage of air, sea and land maneuver. The triad is capable of concentrating Marines in superiority at the decisive time and place.

The Triad Future Amphibious Operation

An amphibious operation may look something like the following example. *The Amphibious Task Force (ATF) has been tasked to respond to a crisis by seizing an airfield and port for follow-on forces. Currently located 500-700 miles at sea, the ATF steams to*

dose with the shore. A CVBG accompanies the ARG, acting as the nucleus for this task force. Satellites provide information on several potential airfields and ports. Follow-on forces, replenishment ships, Maritime Prepositioned Ships and CONUS based units are staging or enroute.

Pre-assault operations are critical to the battlespace shaping process. They include reconnaissance, minesweeping, naval surface fire support, underwater demolition and destruction of beach obstacles. The enemy has a good idea the ATF is coming, but its operational reach places the enemy at an operational dilemma. Several ports and airfields up and down the coast are potential sites for the MAGTF. The enemy must spread his forces over a greater distance to cover all potential sites.

Reconnaissance units are inserted from 340 NM by V-22 at several potential sites 24 hours prior to the assault. The actual site for the landing will be made after recon teams observe enemy positions; conduct route recon; observe avenues of approach; reconnoiter landing sites, beachheads, landing objectives; and search for those surfaces and gaps. The decision will ultimately be made by the CATF/CLF team. Fixed wing aviation and Navy Surface Fires (TIAM) strike at the enemy's critical vulnerabilities (IAD, WMD, C²). The objective at this point is to obtain air superiority, isolate the enemy forces and prepare potential LF and ATF objective areas.

As the ships steam closer, raiding parties are sent inland to neutralize specific targets, harass, probe, interdict and confuse the enemy. The MAGTF is starting to bring the strength of maneuver warfare against selected enemy weaknesses in attempt to collapse the enemy's will. The ATF'S initial focus is to maneuver rather than to establish a beachhead. The emphasis is on a general and very flexible concept of tactical employment ashore. Forces will continue to mass firepower ashore. The mission remains "seizure and defense of a port and airfield" to enable follow-on forces.

As information flows back from inserted recon units and national assets, CATF/CLF jointly select the location for the main effort. The CVBG remain 200-300 miles at sea, providing the much needed umbrella for the remaining task force, as the remaining ships close with the shore. The LHA and LUD will remain at 50-75 NM for the operation; the LPD and LSD continue to close with the shore (35 NM). As they close, the V-22 and CH-53E

(after aerial refueling) conduct a feint to a distant most likely amphibious landing beach to the north. This feint reinforces the enemy perceptions that a landing will come in this direction. As a result, a significant portion of the enemy's main defensive belts are stripped from other beaches. The desired result is to confuse, divide and weaken the defenses. Also at D(-1) a turn away amphibious assault utilizing A4AVs and LCACs is conducted just prior to dusk at different northern site.

At H-hour, D-Day a supporting vertical assault, from over the horizon, is conducted to seize the ATE objective. The ship to objective V-22 assault bypasses the enemy's strong points through the surfaces and gaps. The vertical assault capitalizes on surprise, mobility and flexibility. Meanwhile, an amphibious assault is conducted by mechanized force utilizing A4A V's and LCAC's to seize LE objectives and secure the EBUL located just inland from II and ATE objectives. At the conclusion, both the port and airfield are seized for the follow-on forces.

In this example, the triad provides a versatile, fast moving and hard hitting combined arms team capable of going anywhere rapidly, projecting forces across the shore and sustaining them from the sea. The future assault across defended beaches will be conducted by an integrated Navy/Marine Corps team that is built on the tenants of the triad.

Chapter Four

NOT JUST A GREAT BUMPERSTICKER

As this century draws to a close, a new age in assault support is dawning. Just as the doctrine was developed in the form of a Tentative Operating Manual in 1935, the Marine Corps is refocusing its doctrine to reflect the OMFTS and the single battle concept. Doctrine shall change to meet the challenges of the 21st century with the integration of a joint team able to respond to national needs. The V-22 will change the way the Marine Corps fights with: flexible engagements, shared situational awareness, and owning the night.

It is now apparent that the hostile army in the field may be a false objective, and the real objective is his center of gravity. The Marine Corps' opponents of the future will concentrate forces at our most likely avenues of approach. The Marine Corps must compel the enemy to disperse by striking at the relatively unprotected positions deep in his rear or

exposed flanks. With the V-22 comes the capability to strike directly at an opponent's critical vulnerability or center of gravity and either neutralize or destroy them. This puts a completely new spin on the idea of assault support doctrine and tactics. Exploiting the capability of the V-22, the Marine Corps is no longer lead to "force-on-force engagements" (attrition warfare). The V-22 will enable forces to come from unexpected directions, over difficult terrain where they are least expected. In this position, the enemy will have little choice but to scatter his troops all over to ward off our blows -- the opponent ends up dispersed and his overall position weakened.

"The speed, efficiency, survivability, and capability of the V-22 will make it a valued member of our nations defense force."⁴⁴ The conceptual framework, deployment and employment currently used for medium lift assault support assets will change with the new capabilities of the V-22. The strategic implication of the V-22 is the possibility to deploy Marines rapidly in a matter of days versus relying on strategic air lift and sea lift. The tactical advantage comes from the V-22's unparalleled flexibility for tactical application in the use of speed, maneuverability, range, endurance, self-deployment, payload, survivability and combat power buildup rates which exceeds all helicopter options. How the V-22 is employed and deployed presents unique challenges. Using the V-22 effectively requires innovative thinking past current assault support tactics.

For the V-22 and Tiltrotor...From The Sea to reach their potential, they must become part of the Marine assault support tactics and doctrine instead of a rival culture imposed by force from outside. The development, adoption and implementation of Tiltrotor...From The Sea will bring assault support into the 21st century.

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